WHAT IS CLAIMED IS:

1. A method for gene therapy by small fragment homologous replacement comprising steps:

(a) obtaining a DNA fragment that comprises a DNA sequence to be altered and flanking DNA sequences upstream and downstream thereto;

(b) obtaining a DNA fragment that comprises an altering DNA sequence and flanking DNA sequences upstream and downstream thereto;

(c) delivering altering DNA fragment into a cell under conditions effective for the second DNA fragment to enter the cell and to locate the flanking DNA sequences of the sequence to be altered; and

(d) allowing the corresponding flanking DNA sequences to pair and anneal, and the altering DNA fragment and the DNA fragment to be altered to undergo homologous replacement under cellular conditions to produce a genetically altered cell comprising the altering DNA sequence.

2. The method of claim 1, wherein the DNA sequence to be altered is associated with a disease selected from the group consisting of Fanconi's anemia, cystic fibrosis, sickle cell anemia, retinitis pigmentosa, xeroderma pigmentosa, ataxia telangiectasia, Bloom's syndrome, retinoblastoma, Duchenne's muscular dystrophy, and Tay-Sachs disease.